Handheld LCR Meter

User’s Manual

V1.0.2

Content

Safety

Review the following safety precautions carefully before operate the device to avoid any personal injuries or damages to the device and any products connected to it. To avoid potential hazards use the device as specified by this user's guide only.

- **Only professionally authorized personnel can perform maintenance.**
- **Do not run the product when the outer cover or panel is open.**
- **Do not operate with suspected failures.** If suspected damage occurs with the device, have it inspected by qualified service personnel before further operations.
- **Do not operate in wet/damp conditions.**
- ***Do not use in explosive environments***
- **Keep product surfaces clean and dry.**
- ***Security warning*****:** One should abide by the relevant terms in the manual regarding safety or injury to human body or damages to the product, as well as operation or environment which may result in test failure.

Safety Guidelines

To make sure safe use of equipment, follow these guidelines:

- The instrument is suitable for indoor use and an altitude of less than 2,000 meters. In case of short-term outdoor use, prevent it from direct sunlight, water, electromagnetic radiation, dust, etc.
- Before the use, please read and understand the warning and safety information mentioned in this manual.
- Use the instrument according to the function specified in the manual.
- If the component needs measurement, make sure the circuit is turned off and all capacitors in the circuit are discharged before the measurement.
- Before the measurement, components such as capacitors shall be discharged.
- The lithium battery of 18650 or Type C-USB is used to provide power for the instrument. It can be charged with Type C-USB port.

Safety Symbols

 **Warning:** Remind the user to follow the operating procedures in the manual.

Environment

- Please do not operate the instrument in the place that is dusty, vibrative, under direct sunlight or where there is corrosive air.
- The normal working temperature is 0℃～40℃, relative humidity ≤75%, so the instrument should be used under above condition to guarantee the accuracy.
- Please store the instrument in the place where temperature is between 5℃ and 40℃, humidity is less than 85%RH. If the instrument will not be put in use for a time, please have it properly packed with its original box or a similar box for storing.
- The instrument, especially the test cable should be far from strong electro-magnetic field, to avoid the jamming on measurement.

Use of Test Fixture

Please use the accessory test fixture or cable together with your device. The test fixture made by user or from other company may cause the incorrect measurement result. The test fixture, cable and the pin of DUT should be kept clean, thus to guarantee the good connection between DUT and fixture.

Warm-up

- To guarantee the accurate measurement, the warm-up time is no less than 15min.
- Please not turn on or off instrument frequently, in order to avoid the inner data fluster.

General Check

When you have got a new LCR, it is suggested that you should perform a general inspection on the instrument according to the following steps:

- **Check the shipping container for damage:**

Inspect the shipping container for damage after unpacking it. It is not recommended to power on the instrument in the case of a damaged container.

- **Check the accessories:**

Accessories supplied with the instrument are listed in "Accessories" in this manual. If the contents are incomplete or damaged, please notify our distributor at your local area or the sales department.

- **Check the instrument:**

In case there is any mechanical damage or defect, or the instrument does not operate properly, please notify our distributor at your local area or the sales department.

Introduction

This handheld LCR meter is used to measure inductance, capacitance, resistance and other components of the parameters, small size, using 7.4V lithium battery power supply, can be applied to desktop applications, more mobile measurement and handheld measurement occasions to provide great convenience.

It provides a resolution of four thousands digits for main parameters and a resolution of 0.0001 for secondary parameter. The highest measurement frequency is 100kHz, and can measure the level of 0.6Vrms, 0.3Vrms. Its automatic range can display the results in the fast, medium, or slow mode. It can automatically select the appropriate measurement parameters according to the characteristics of the component. The measurement accuracy can reach 0.25%. It combines the convenience of a handheld instrument and good performance of a table-type one.

The operation is simple and intuitive, and the test frequency, parameters and speed can be selected immediately. It also has a recording mode to assist in reading data. Open circuit and short circuit correction function to improve the accuracy of measurement. Practical configuration menu can set buzzer, automatic shutdown, language and other operations.

The instrument is equipped with remote communication function and can be connected to PC via Type C-USB cable for remote control and data acquisition.

Chapter 1 Overview of front panel

1.1 Front panel



Description of the front panel is shown in the figure (Note: In this manual, long press means holding the key for more than 2 seconds).

1. Display: 2.8 inch TFT LCD screen, which display all functions of the instrument.

2. R-X shortcut key: Select the main parameter as R and the secondary parameter as X directly.

3. C-D shortcut key: Select the main parameter as C and the secondary parameter as D directly.

4. L-Q shortcut key: Select the main parameter as L and the secondary parameter as Q directly.

5. Data holding recording key: Turn on or off the data holding function.

6. Frequency key: Switch to fixed frequency quickly.

7. Range key: Switch to the required range quickly. You can select Auto, 10Ω, 100Ω, 1kΩ, 10kΩ and 100kΩ in turn. Auto is the automatic range, LCR will automatically select the appropriate hardware range according to the current tested component, and the other ranges are the fixed gear position.

8. Level shortcut key: Switch to the fixed level (300mV, 600mV RMS) quickly.

9. Measuring speed key: Switch to the required measurement speed (Fast, Medium and Slow).

10. Main parameter key: Switch to the main parameters quickly. You can select Auto, R, L, C, Z in turn. Auto is the function of automatic parameters. LCR selects the appropriate combination of main parameters and secondary parameters according to the properties of the current tested component.

11. Secondary parameter key: Switch to the secondary parameters quickly. If the main parameter select as Auto, this key will not work.

12. Equivalent mode key: Switch equivalent between SER and PAL quickly. User should select the equivalent mode according to test need.

13. Set key: Press the key to enter the setting interface to set the system language, automatic shutdown, display brightness, boot state and buzzer. Click again the key in the setting interface to view the device system information. Click again it to return to the test interface.

14. Arrow keys: left and right arrow keys to control the movement of the cursor; up and down arrow keys to select the parameter.

15. Power key: Press it to turn on or off the instrument.

16. Data holding recording key: Press to turn on or off the data holding function. Press the key successively can switch functions of MAX, MIN and AVG in turn, and return to normal test interface after completing one cycle. If you change the main or secondary parameter, it will exit this function. The function is disabled in automatic parameters.

17. Relative and correction multifunctional key: Short press to turn on or off the relative function, short press again to exit the relative value (REL) function. Long press to turn on the correction function.

18. Comparator switch and tolerance limits shortcut multifunctional key: Long press to turn on or off the comparator. Short press to quickly switch deviation tolerance limit.

19. 3-terminal test jack

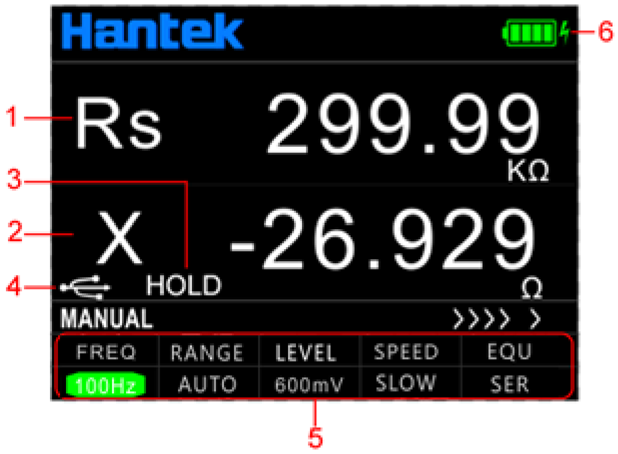
20. 5-terminal test notch

Note: Please see the label on the adapter for its input parameters; use the supplied adapter, or purchase the specified power adapter from our company. The use of other adapters may cause unnecessary damage.

Reminder: After connect the external power supply, the internal battery power supply circuit will be automatically cut off and charge the battery, the LCR has an independent charging management controller, even when the instrument is turned off, the charging control still works normally.

1.2 User's Interface

1.2.1 Measurement Interface

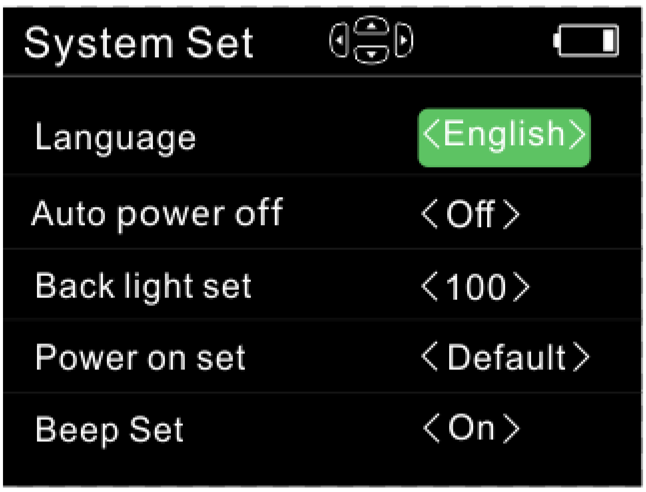


1. Main parameter display
2. Secondary parameter display
3. 'HOLD' indicates the data holding state.
4.  USB connection state, displayed when it is connected to the PC and hidden at any other time;

When connected the instrument to the computer in the initial, the USB icon is white, which means that the USB is connected. At this time, the key is still available and unlocked. After receiving the first effective command, the USB icon becomes green, which means that the computer is communicated with the instrument successfully. The front panel button is unlocked after USB is pulled out or *GTL command is used. Then the USB icon turns white again and the button is available.

5. Measurement parameter settings
6. Battery power icon: The remaining power is indicated. Please timely charge the instrument when the power is insufficient.

1.2.2 System settings interface



On the system settings interface users can set the language, auto power off, brightness, power setting and buzzer. And view the model and version of the instrument.

Press [SET] key to enter the system setting interface, press the arrow key to select the setting option and highlight, and press the arrow key for specific setting. Then press the [SET] button again to view the model and version of the instrument. Press [SET] key again to exit the system setting interface.

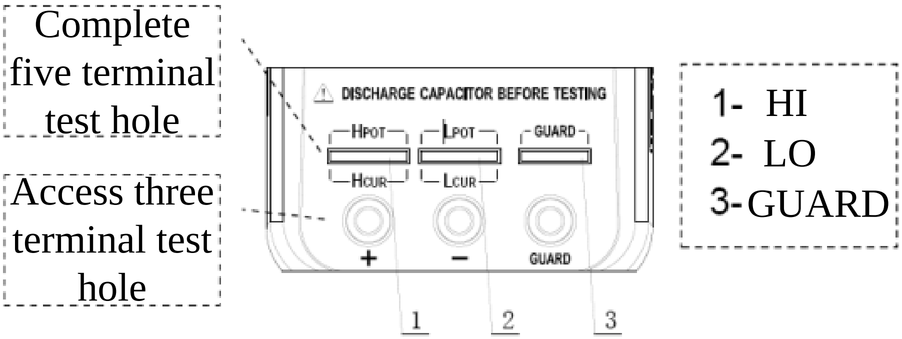
Power on setting:

Default: If the power on setting is <default>, all setting will be system default for next start.

Last: If the boot setting is <Last>, the test parameters, system language, automatic shutdown, back light setting and beep setting will be saved for the next start.

1.3 Test port

The serial LCR uses the 3-terminal and 5-terminal test ports at the same time, which is to combine convenience and high accuracy for the test. See the figure for the test terminal.



The three-terminal test port of the instrument uses the standard rubber jack, therefore the inexpensive rubber plug- alligator clip can be used as the test line. It is very convenient to apply the extended test, but the drawback is low testing accuracy.

To improve the accuracy of the test line when using the extension line, the LCR is also equipped with the five-terminal test notch for dedicated test fixture. It renders possible the complete four-terminal measurement of the extension line to ensure the high testing accuracy.

Chapter 2 Operation instruction

2.1 Startup and shutdown

Press the power key to start the instrument and the measurement interface is shown (default). Press the power key again to shutdown it.

2.2 Test parameter

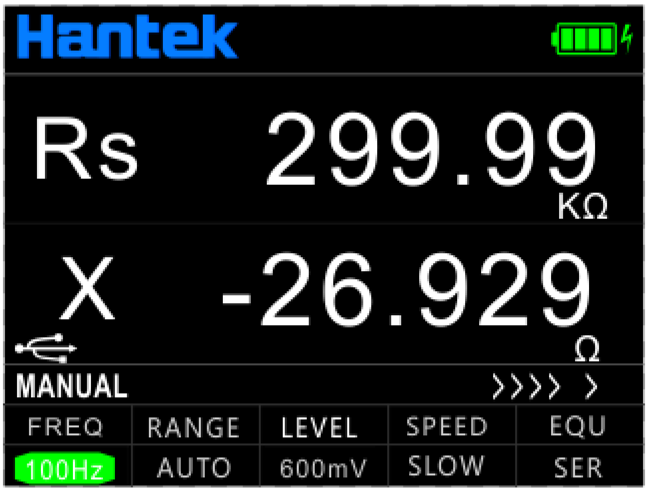
2.2.1 Test frequency

Handheld LCR applies AC test signal to the DUT for measurement. Frequency is one of the main parameters of the AC source. Due to the presence of the non-ideal and distributed parameters of component, and the impact of the distributed parameters between the test terminals, the same component may have different results with different test frequencies. So, please select appropriate frequency to test.

There are two ways to change the test frequency:

Method 1: Press [FREQ] key to switch different frequencies.

Method 2: Press the right and left arrow keys to move the cursor to the FREQ zone as shown in below figure, and press the up and down arrow keys to switch frequencies.



2.2.2 Test level

Handheld LCR applies AC test signal to the DUT for measurement. Both the frequency and signal level can be changed.

There are two ways to change the test level:

Method 1: Press [LEVEL] key to switch between different test signals level.

Method 2: Press the right and left arrow keys to move the cursor to the LEVEL zone, and press the up and down arrow keys to switch levels.

2.2.3 Test range

There are two ways to change the test range:

Method 1: Press [RANGE] key to switch between different test ranges.

Method 2: Turn on the instrument and the measurement display is shown, press the left and right arrow keys to move the cursor to the RANGE zone, and the up and down arrow keys to switch the range (AUTO, 100Ω, 1kΩ, 10kΩ, 100kΩ).

2.2.4 Test speed

There are two ways to change the test speed:

Method 1: Turn on the instrument and the measurement display is shown, press [SPEED] to switch to the next measurement speed (fast, medium, slow). Above the status bar the corresponding measurement speed is displayed. Fast (4 times /s), Medium (2 times /s), Slow (1 time /s).

Method 2: Turn on the instrument and the measurement display is shown, press the left and right arrow keys to move the cursor to the SPEED zone, and the up and down arrow keys to switch the test speed.

2.2.5 Main parameters

Parameter and symbol

R: resistance C: capacitance L: inductance Z: impedance

Select the type of measurement parameter, then select the main parameter.

Press [AUTO/R/L/C/Z] key to switch the main parameters(R, L, C, Z and AUTO) in sequence. When AUTO is selected for the main parameter, the main parameter font is shown in red.

2.2.6 Secondary parameters

Parameter and symbol

X: reactance D: dissipation factor Q: quality factor θ: phase angle

ESR: equivalent series resistance

If necessary, press [X/D/Q/θ/ESR] key to select the secondary parameter.

If the main parameter select as Auto, this key will not work.

2.2.7 Set nominal value of tolerance mode

The method of setting the nominal value is as follows:

1. Turn on the instrument and the measurement display is shown, the component with required nominal should be placed on the test clip of the instrument.

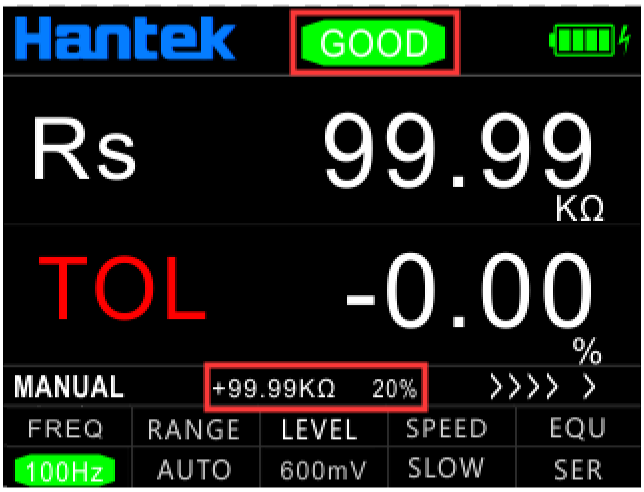
2. Long press [COMPARE] to turn on the comparator, and the nominal value is the value of the measured element.

The nominal value and tolerance will be displayed in the status bar as shown in the below figure.

The deviation value between current test value and standard value will display on the secondary parameter position.

Short press this key to select the required tolerance value successively (1%, 5%, 10% and 20% optional). The color bar at the top of the screen will be used to judge GOOD/NG. Green GOOD means within tolerance, red NG means beyond tolerance, the indicator light of this key lights up at the same time.

Long press this button or change the primary and secondary parameters to exit this function.



Note: This function cannot work if the main parameter select as Auto.

2.2.8 Equivalent mode

Due to the non-ideal and distributed parameters of component, the actual components tend to be equivalent with the combination of ideal elements. Generally LCR tester uses two simple equivalent models--series and parallel. Selecting the proper equivalent model will lead to better measurement results. In general, low-impedance elements (such as that below 100Ω) should use the series equivalent model; a high impedance element (such as that above 10kΩ) should use the parallel equivalent model; the equivalent model affects less the measurement result of the one in between the two above models.
Press [SER/PAL] key to switch equivalent mode (SER, PAL).

2.3 Relative mode

Press [REL] to turn on the relative function and the current value is used as reference. The reference value and relative value will be shown respectively on the secondary and main display. Press the key again to exit the function.

2.4 Reading hold mode (HOLD)

The data hold function is used to freeze the displayed data. The measurement is still in progress, but the data on the LCD is not updated as the measurements proceed.
Turn on reading hold:

Press the [HOLD] key, and "LOLD" will be shown on the LCD to indicate that the data hold function is activated. And measurement results for the main and secondary parameters are those displayed before pressing the HOLD key.
Turn off reading hold:
In hold mode, press again the [HOLD] key, and "HOLD" disappears from the LCD, the instrument returns to normal measurement mode.

2.5 Data recording function

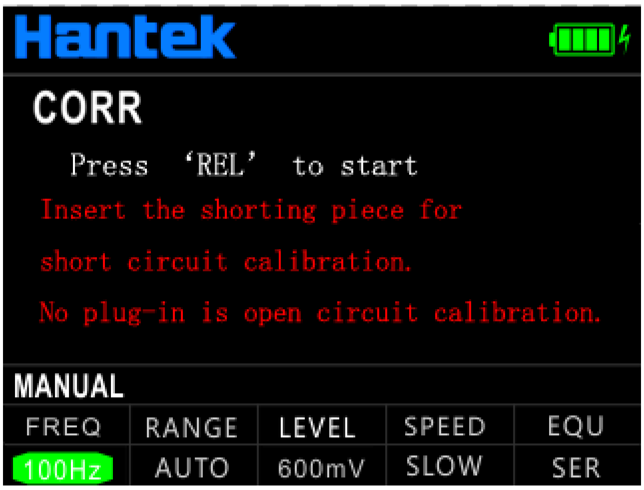
If the measurement data of the DUT see poor stability and fluctuate within a certain range, use the data recording mode to acquire the readings. In the data recording mode, the maximum, minimum and average can be dynamically obtained within a certain range.
Turn on the recording function:
Press [RECORD] key to turn on the data recording function, and the recorded value is shown on the secondary display, then press the key to select the display of the maximum, minimum, or average in successively.
This function records the maximum value, minimum value of the main parameter and the average value of the last ten tests.
Note: After changing the type of the measurement parameter, it will automatically exit from the data recording function. This function cannot work if the main parameter select as Auto.

2.6 Correction function

The correction function includes the open and short circuit. By correcting it can effectively reduce the error of distributed parameters caused by the test line. The short circuit correction can reduce the impact of the contact resistance and lead resistance on the measurement of low impedance element. The open circuit correction can reduce the impact of the distributed capacitance and resistance between the two ends of the test line on the measurement of high impedance element.

The method of correction is shown as follows:

1. Before entering the correction function, please ensure that the test terminals are open- or short-circuited. Long press [REL] key to enter the correction interface.



2. Short press [REL] key for open (OPEN) or short (SHORT) circuit correction, then the instrument detects automatically whether it is open or short circuit. If the correction is successful, the secondary display shows "SUCCESS"; or it shows "FAILED".

Note: Do not change the state of the test terminals during the correction.

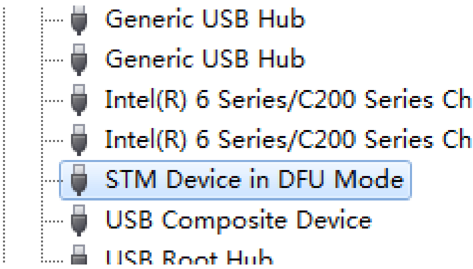
3. Once finished the correction ends, press [REL] key to return to the measurement display.

2.7 Firmware Update

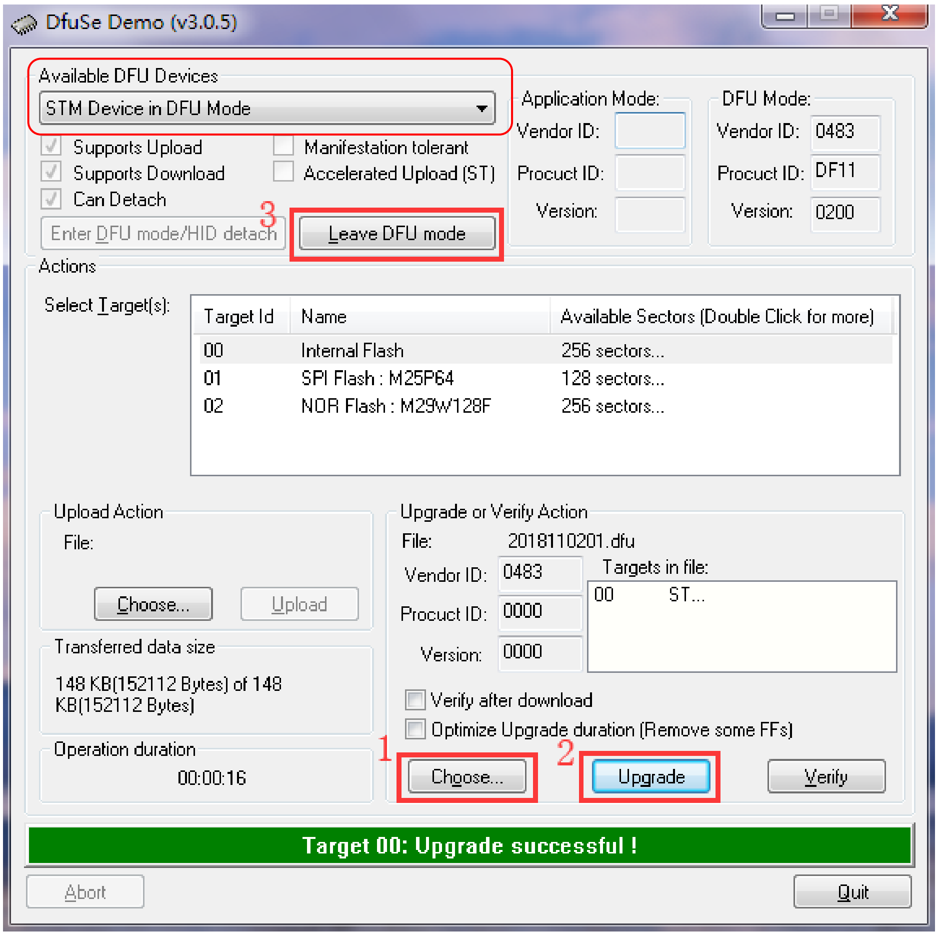
1. Download the tool "DfuSe Demo v3.0.5" and install it. Download upgrade firmware (***. Dfu).
2. In the shutdown state, keep pressing R-X key and insert the USB cable into the Type C port of the device to connect the device to the computer.



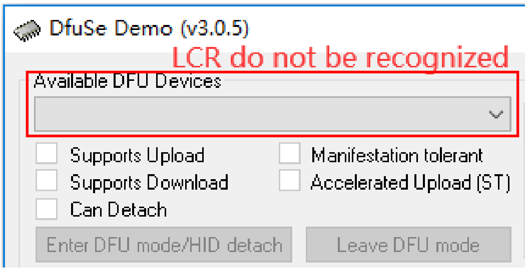
You can see the device is identified in device manager of the PC:



3. Open DfuSe Demo software, click "Choose" button to select the Upgrade firmware (***. Dfu), and click "Upgrade" to Upgrade it. After finished it, click "Leave DFU mode" to exit the programming mode.



If the device is not identified, please repeat step 2.



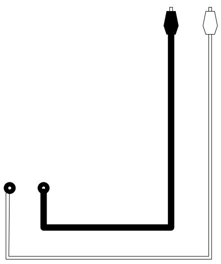
4. Close the “DfuSe Demo” software.

Chapter 3 Quick application guide

Warning:

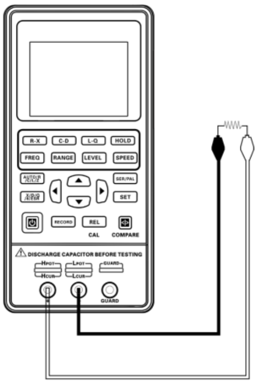
- **Do not measure the charged capacitor, or it may cause damage to the instrument.**
- **In case of measurement of on-board devices, make sure the power is turned off. The active circuit cannot be measured directly.**
- **When used in the dusty environment, the instrument is easy to gather dirt, so it should be cleaned periodically to protect the test port to prevent the dust from entering the instrument. The accumulation of dust will be conductive and affect the use of the instrument.**
- **Do not place the instrument directly in the environments with explosives, direct sunlight and excessive heat.**

Reminder: To achieve the proper measurement accuracy, refer to the "correction function" section for open and short circuit correction before the measurement. The test fixture can be rubber plug - alligator clip (see figure), or the component can be directly inserted into the test notch. The rubber plug - alligator clips are mainly used in the following examples.

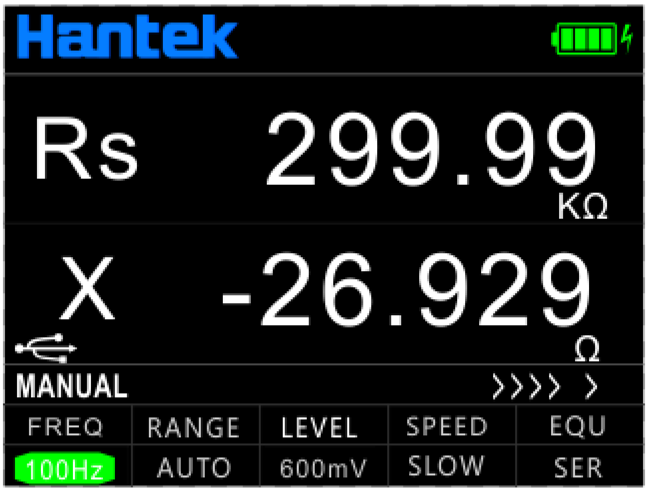


3.1 Resistance measurement

See the below figure for the connection test.



1. Press the power key to start the instrument.
2. Press the [AUTO/R/C/L/Z] key until Rs/Rp is displayed on the interface which means to select resistance measurement.



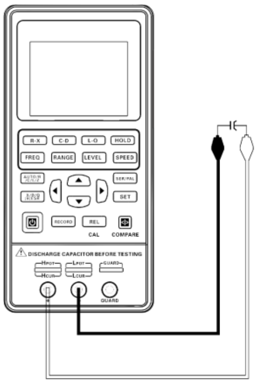
3. Insert the resistor into the test notch, or choose the appropriate test accessories (rubber plug - alligator clip) and connect it with the measured resistance.
4. Press the [FREQ] key to select the desired test frequency, press [LEVEL] to select the desired level.
5. Read the measurement results from the screen.

Note: the AC signal is used by the instrument to measure the resistance, so the test result reflects the AC resistance characteristics of the instrument instead of its DC resistance.

3.2 Capacitance measurement

Warning: Make sure that the capacitor has been fully discharged before measuring.

See the below figure for the connection test.

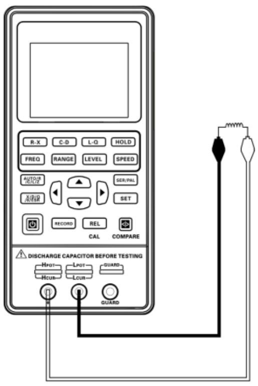


1. Press the power key to start the instrument.
2. Press the [AUTO/R/C/L/Z] key until Cs/Cp is displayed on the interface which means to select capacitance measurement.
3. Insert the capacitor into the test notch, or choose the appropriate test accessories (rubber plug - alligator clip) and connect it with the measured capacitor.
4. Press the [FREQ] key to select the desired test frequency, press [LEVEL] key to select the desired level.
5. Read the measurement results from the screen.

Note: The capacitor or capacitive device must be fully discharged before the test; the capacitor with large capacity may need longer time to discharge. If the capacitive device not fully discharged is connected, it can damage the components inside the instrument.

3.3 Inductance measurement

See below figure for the connection test.



1. Press the power key to start the instrument.
2. Press the [AUTO/R/C/L/Z] key until Ls/Lp is displayed on the interface which means to select inductance measurement.
3. Insert the inductor into the test notch, or choose the appropriate test accessories (rubber plug - alligator clip, Kelvin test fixture, etc.) and connect it with the measured inductor.
4. Press the [FREQ] key to select the desired test frequency, press [LEVEL] to select the desired level.
5. Read the measurement results from the screen.

3.4 Impedance measurement

1. Press the power key to start the instrument.
2. Press the [AUTO/R/C/L/Z] key until Z is displayed on the interface which means to select impedance measurement.
3. Insert the impeder into the test notch, or choose the appropriate test accessories (rubber plug - alligator clip, Kelvin test fixture, etc.) and connect it with the measured impeder.
4. Press the [FREQ] key to select the desired test frequency, press [LEVEL] to select the desired level.
5. Read the measurement results from the screen.

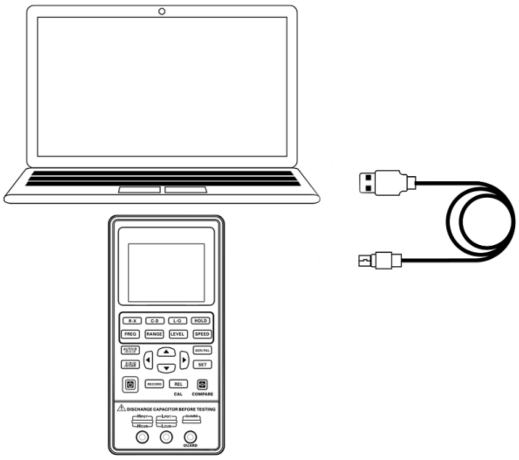
Chapter 4 Telecommunication

The instrument can be connected to PC through the Type C-USB interface. After installing the driver on the PC, handheld LCR can be controlled from or the test results acquired by the PC through the virtual serial port.

4.1 Connect the instrument to PC

Please refer to following steps to connect to PC:

1. Locate the USB driver software in the CD.
2. Use the Type C-USB cable to connect the instrument to the USB port of the PC, shown in below Figure, press the power key to start the instrument.
3. After the installation is completed, check the serial number in Windows' Device Manager.



Remote Control State:

When the LCR receives the remote operation state instruction from the host, the instrument automatically enters into the remote control state. USB icon is displayed in green to show the entry into the remote control state. To exit the remote control state, please send the "*GTL" command.

Command Protocol:

Handheld LCR uses SCPI command set to transfer control command and return query information and data with string. The terminator specified by the protocal shows the end of a command line or information enquiry line.
Using SCPI command set enables the interaction control of PC over the instrument by programming. The command format meets the standard which is easy to understand and use.

Data type

The data in the form of ASCII characters transmitted on the bus may have the following types:

Type	Meaning	Example
<NR1>	Integer	+800,-200,100
<NR2>	Decimal	+1.56,-0.001
<NR3>	Exponential floating number	+2.345678E+04 -1.345678E-02

Rules of grammar

Notation	Definition
:	Colon, enter the next level of the command
;	Semicolon, the same level of command
*	Asterisk, public command
,	Comma, multi-parameter separator
?	Question mark indicates the query
	Spacing, separating commands and parameters
“ ”	Quotes for quoted part

Symbol used in instruction

These marks are added in order to specify the command format, but are not part of the command.

Marks	Definition
[ ]	The optional command parameters are given in the square brackets
|	Division mark—to select one from many
< >	The definition of the variable parameter is given or the variable parameters listed in the angle brackets
( )	Interpretation which is not seen in the actual command

Abbreviations and capitalization:

1) The command has full format and abbreviated format, in the following descriptions of the command, capitalization represents abbreviation, and the abbreviated command has the same effect with the complete command;
2) Abbreviations are generally expressed by four letters of the complete command, the random abbreviation which does not appear in the command table will be considered as the wrong command;
3) There is no difference regarding capitalization for ASCII command actually transmitted on the bus and the letters of parameter.

Error code

Code	Content	Definition
E10	Unknown Command!	Unknown Command!
E11	Parameter Error!	Parameter Error!
E12	Syntax Error!	Syntax Error!
E13	Data Not Ready!	Data Not Ready!

Terminator

You can choose anyone of the following characters to end.

<CR> (Enter 0x0D)

<LF> (Line break 0x0A)

<CR> <LF>

4.2 Command Reference

4.2.1 Public command

Public command applied universally to various kinds of instrument defined by the public command IEEE488, the public command starts with *. For example, *IDN?，*GTL，*LLO. This machine supports only a few Public commands.

(1) *IDN?

Description: inquiry instrument information and version information

Return: < instrument hardware name >, < software version >, < serial number >, < hardware version >

(2) *GTL

Description: used to unlock keyboard and resume keyboard operation

Return: None

4.2.2 Subsystem commands

FREQuency Subsystem

(1) FREQuency <value>

Description: set the measurement frequency

Parameter: 100, 120, 400, 1000, 4000, 10000, 40000, 50000, 75000, 100000 or 100Hz,120Hz, 400Hz, 1kHz, 4kHz, 10kHz ,40kHz, 50kHz, 75kHz, 100kHz (Please refer to the model of LCR.)

Return: None

(2) FREQuency ?

Description: query current test frequency

Parameter: None

Return: <100|120|400|1000|4000|10000|40000|50000|75000|100000>(Please refer to the

FUNCtion Subsystem

(1) FUNCtion:impa <R|L|C|Z|Auto>

Description: Select the main parameter type

Parameter: <R|L|C|Z|Auto>

Return: None

(2) FUNCtion:impa ?

Description: Query the main parameter type

Parameter: None

Return: <l-auto|c-auto|z-auto|r|l|c>

(3) FUNCtion:impb <X|Q|D|THETA|ESR>

Description: Select a secondary parameter type

Parameter: <X|Q|D|THETA|ESR>

Return: None

(4) FUNCtion:impb ?

Description: Query a secondary parameter type

Parameter: None

Return: <rec|q-auto|d-auto|theta-auto|x|q|d|theta|esr>

(5) FUNCtion:RANGe <AUTO|10|100|1000|10000|100000>

Or FUNCtion:RANGe <AUTO|10ohm|100ohm|1kohm|10kohm|100kohm>

Description: Select the range

Parameter: <AUTO|10|100|1000|10000|100000>

Or <AUTO|10ohm|100ohm|1kohm|10kohm|100kohm>

Return: None

(6) FUNCtion: RANGe ?

Description: Query the range

Parameter: None

Return: <auto|10|100|1000|10000|100000>

(7) FUNCtion:LEVel <300|600>

Or FUNCtion: LEVel <300mv|600mv>

Description: Select the level

Parameter: <300|600> or <300mv|600mv>

Return: None

(8) FUNCtion: LEVel ?

Description: Query the level

Parameter: None

Return: <300|600>

(9) FUNCtion:EQUivalent <SER|PAL>

Or FUNCtion:EQUivalent <SERIES| PARALLEL>

Description: Select the equivalent mode

Parameter: <SER|PAL> or <SERIES| PARALLEL>

Return: None

(10) FUNCtion: EQUivalent ?

Description: Query the equivalent mode

Parameter: None

Return: <ser|pal>

FETCh Subsystem

FETCh ?

Description: Query data

Parameter: None

Return: <NR3,NR3,NR1> Main parameters, secondary parameters, gear number

Chapter 5 Specification

The general and measurement precision specification of LCR are described below.

5.1 General Specification

Model	Hantek1832C	Hantek1833C
Measurement parameters	Main parameter: L/C/R/Z Secondary parameter: X/D/Q/ θ /ESR	
Equivalent mode	Series, parallel	
Mode of range	Manual, automatic	
Measurement speed	Fast(4 times/s), medium(2 times/s), slow(1 times/s)	
Configuration of the test terminal	3-terminal, 5-terminal	
Correction function	Short circuit, Open circuit	
Communication interface	Type C(virtual serial port)	
Test signal frequency	100Hz, 120Hz, 400Hz, 1kHz, 4KHz, 10kHz, 40kHz	100Hz, 120Hz, 400Hz, 1kHz, 4KHz, 10kHz, 40kHz, 50KHz, 75KHz, 100kHz
Test signal level	0.6Vrms	0.3Vrms, 0.6Vrms
Output impedance	100Ω	
Highest accuracy (see accuracy index for details)	Resistance: 0.25% Capacitance: 0.4%	
Measurement range	L: 0-2000H C: 0-20mF R: 0-20MΩ	

5.2 Accuracy

Notes:

- ***Environment temperature: 20℃ ± 2℃, humidity: ≤75% R.H;***
- ***Preheat the instrument for at least 30 minutes before the test;***
- ***Test at the test notch on the end face of the instrument;***
- ***It is better to conduct open and short circuit correction before the test;***
- ***Measure with the recommended equivalent mode;***
- ***The percentage in terms of error indicates:***
- ***± (% of the reading + last digit)***
- ***If the actual measurement of the instrument and the display exceeds the scope specified in the table, the accuracy of the excessive part will not be given;***
- ***The meaning of the subscript***
- ***S- series equivalent; p- parallel equivalent; e- accuracy***
- ***Some parameters cannot be given in the data table, and it can only be calculated based on the measurement results;***

Capacitance C and dissipation D

■ 100Hz/120Hz/400Hz

Range	Range of display	Accuracy Ce	Accuracy De	Equivalent mode recommended
20mF	4.000mF~20.000mF	8.00%+5 digits	0.0800	Series
4mF	400.0μF~3.9999mF	2.00%+3 digits	0.0200	Series
400μF	40.00μF~399.99μF	0.60%+2 digits	0.0060	Series
40μF	4.000μF~39.999μF	0.40%+2 digits	0.0040	Series
4μF	400.0nF~3.9999μF	0.40%+2 digits	0.0040	----
400nF	40.00nF~399.99nF	0.4%+2 digits	0.0040	Parallel
40nF	4.000nF~39.999nF	0.5%+3 digits	0.0050	Parallel
4nF	0pF~3.999nF	1.5%+5 digits	------	Parallel

■ 1kHz/4KHz

Range	Range of display	Accuracy Ce	Accuracy De	Equivalent mode recommended
1000uF	400.0uF~999.9uF	3.00%+5 digits	0.0300	Series
400μF	40.00μF~399.99μF	1.50%+3 digits	0.0150	Series
40μF	4.000μF~39.999μF	0.60%+2 digits	0.0060	Series
4μF	400.0nF~3.9999μF	0.40%+2 digits	0.0040	----
400nF	40.00nF~399.99nF	0.4%+2 digits	0.0040	Parallel
40nF	4.000nF~39.999nF	0.6%+3 digits	0.0060	Parallel
4nF	400.0pF~3.9999nF	0.6%+3 digits	0.0060	Parallel
400pF	0.0pF~399.9pF	3%+5 digits	------	Parallel

■ 10kHz

Range	Range of display	Accuracy Ce	Accuracy De	Equivalent mode recommended
100μF	40.00μF~100.00μF	4.00%+5 digits	0.0400	Series
40μF	4.000μF~39.999μF	2.0%+3 digits	0.0200	Series
4μF	400.0nF~3.9999μF	0.60%+2 digits	0.0060	Series
400nF	40.00nF~399.99nF	0.4%+2 digits	0.0040	Series
40nF	4.000nF~39.999nF	0.4%+2 digits	0.0040	------
4nF	400.0pF~3.9999nF	0.4%+2 digits	0.0040	Parallel
400pF	40.00pF~399.99pF	0.6%+3 digits	0.0060	Parallel
40pF	0.00pF~39.99pF	2.5%+5 digits	------	Parallel

■ 40kHz/50KHz

Range	Range of display	Accuracy Ce	Accuracy De	Equivalent mode recommended
100μF	40.00μF~100.00μF	6.00%+5 digits	0.0600	Series
40μF	4.000μF~39.999μF	4.0%+3 digits	0.0400	Series
4μF	400.0nF~3.9999μF	1.0%+2 digits	0.0100	Series
400nF	40.00nF~399.99nF	0.6%+2 digits	0.0060	Series

40nF	4.000nF~39.999nF	0.6%+2 digits	0.0060	------
4nF	400.0pF~3.9999nF	0.6%+2 digits	0.0060	Parallel
400pF	40.00pF~399.99pF	1%+3 digits	0.0100	Parallel
40pF	0.000pF~39.999pF	3%+5 digits	------	Parallel

■ **75KHz/100kHz**

Range	Range of display	Accuracy Ce	Accuracy De	Equivalent mode recommended
10μF	4.000μF~10.000μF	8.0%+20 digits	0.0800	Series
4μF	400.0nF~3.9999μF	5.0%+10 digits	0.050	Series
400nF	40.00nF~399.99nF	1.5%+5 digits	0.0150	Series
40nF	4.000nF~39.999nF	1%+2 digits	0.0100	Series
4nF	400.0pF~3.999nF	1%+2 digits	0.0100	------
400pF	40.00pF~399.99pF	1.5%+2 digits	0.0150	Parallel
40pF	4.000pF~39.999pF	2%+5 digits	0.0200	Parallel
4pF	0.000pF~3.999pF	5%+10 digits	------	Parallel

Inductance L and quality factor

■ **100Hz/120Hz/400Hz**

Range	Range of display	Accuracy Le	Accuracy De*	Equivalent mode recommended
1000H	400.0H~999.9H	2.00%+3 digits	0.0200	Parallel
400H	40.00H~399.99H	0.60%+2 digits	0.0060	Parallel
40H	4.000H~39.999H	0.40%+2 digits	0.0040	Parallel
4H	400.0mH~3.9999H	0.40%+2 digits	0.0040	----
400mH	40.00mH~399.99mH	0.4%+2 digits	0.0040	Series
40mH	4.000mH~39.999mH	0.6%+3 digits	0.0060	Series
4mH	0uH~3.999mH	3.0%+5 digits	------	Series

■ **1kHz/4KHz**

Range	Range of display	Accuracy Le	Accuracy De*	Equivalent mode recommended
1H	400.0mH~999.9mH	1.50%+3 digits	0.0150	Parallel
400mH	40.00mH~399.99mH	0.4%+2 digits	0.0040	Parallel
40mH	4.000mH~39.999mH	0.4%+2 digits	0.0040	------
4mH	400.0uH~3.9999mH	0.4%+2 digits	0.0040	Series
400uH	40.00uH~399.99uH	0.8%+3 digits	0.0080	Series
40uH	0.0uH~39.9uH	3.0%+5 digits	------	Series

■ **10kHz/40KHz**

Range	Range of display	Accuracy Le	Accuracy De*	Equivalent mode recommended
100H	40.00H~100.00H	2.0%+3 digits	0.0200	Parallel
40H	4.000H~39.999H	0.60%+2 digits	0.0060	Parallel
4H	400.0mH~3.9999H	0.40%+2 digits	0.0040	Parallel

400mH	40.00mH~399.99mH	0.4%+2 digits	0.0040	------
40mH	4.000mH~39.999mH	0.4%+2 digits	0.0040	Series
4mH	400.0uH~3.9999mH	1%+3 digits	0.0100	Series
400uH	0.00uH~399.99uH	3.0%+5 digits	------	Series

- **40kHz/50KHz**

Range	**Range of display**	**Accuracy Le**	**Accuracy De***	**Equivalent mode recommended**
1H	400.0mH~999.9mH	2.0%+4 digits	0.0200	Parallel
400mH	40.00mH~399.99mH	0.8%+2 digits	0.0080	Parallel
40mH	4.000mH~39.999mH	0.8%+2 digits	0.0080	------
4mH	400.0uH~3.9999mH	0.8%+2 digits	0.0080	Series
400uH	40.00uH~399.99uH	1.5%+3 digits	0.0150	Series
40uH	0.000uH~39.999uH	4.0%+5 digits	------	Series

Note*: please calculate the quality factor according to the formula to calculate the accuracy of Q.

- **75KHz/100kHz**

Range	**Range of display**	**Accuracy Le**	**Accuracy De***	**Equivalent mode recommended**
400mH	40.00mH~399.99mH	2.5%+2 digits	0.0250	Parallel
40mH	4.000mH~39.999mH	1.5%+2 digits	0.0150	Parallel
4mH	400.0μH~3.9999mH	1.0%+2 digits	0.0100	------
400μH	40.00μH~399.99μH	1.0%+2 digits	0.0100	Series
40μH	4.000μH~39.999μH	1.5%+5 digits	0.0150	Series
4μH	0.000μH~3.999μH	4%+10 digits	------	Series

Impedance Z and phase angle θ

■ 100Hz/120Hz/400Hz/1kHz/4KHz/10kHz

Range	Range of display	Accuracy Ze	Accuracy θ_e	Equivalent mode recommended
20MΩ	4.000MΩ~20.000MΩ	3.0%+10 digits	3.4°	Parallel
4MΩ	400.0kΩ~3.9999MΩ	1.2%+3 digits	0.7°	Parallel
400kΩ	40.00kΩ~399.99kΩ	0.3%+3 digits	0.2°	Parallel
40kΩ	4.000kΩ~39.999kΩ	0.25%+2 digits	0.1°	------
4kΩ	400.0Ω~3.9999kΩ	0.25%+2 digits	0.1°	Series
400Ω	40.00Ω~399.99Ω	0.25%+2 digits	0.1°	Series
40Ω	4.000Ω~39.999Ω	0.5%+3 digits	0.3°	Series
4Ω	0.4000Ω~3.9999Ω	2.0%+3 digits	1.1°	Series
0.4Ω	0.0000Ω~0.3999Ω	4.0%+3 digits	------	Series

■ 40kHz/50KHz

Range	Range of display	Accuracy Ze	Accuracy θ_e	Equivalent mode recommended
20MΩ	4.000MΩ~20.000MΩ	7.0%+41 digits	4.0°	Parallel
4MΩ	400.0kΩ~3.9999MΩ	2.5%+3 digits	1.4°	Parallel
400kΩ	40.00kΩ~399.99kΩ	1.0%+4 digits	0.6°	Parallel
40kΩ	4.000kΩ~39.999kΩ	1.0%+4 digits	0.6°	------
4kΩ	400.0Ω~3.9999kΩ	0.5%+3 digits	0.3°	Series
400Ω	40.00Ω~399.99Ω	0.5%+3 digits	0.3°	Series
40Ω	4.000Ω~39.999Ω	0.7%+4 digits	0.4°	Series
4Ω	0.4000Ω~3.9999Ω	2.0%+6 digits	1.1°	Series
0.4Ω	0.0000Ω~0.3999Ω	5.0%+10 digits	------	Series

■ 75KHz/100kHz

Range	Range of display	Accuracy Ze	Accuracy θ_e	Equivalent mode recommended
20MΩ	4.000MΩ~20.000MΩ	9.0%+20 digits	5.2°	Parallel
4MΩ	400.0kΩ~3.9999MΩ	4.0%+10 digits	2.3°	Parallel
400kΩ	40.00kΩ~399.99kΩ	1.5%+4 digits	0.9°	Parallel
40kΩ	4.000kΩ~39.999kΩ	1.0%+2 digits	0.6°	Parallel
4kΩ	400.0Ω~3.9999kΩ	0.7%+2 digits	0.4°	------
400Ω	40.00Ω~399.99Ω	0.7%+2 digits	0.4°	Series
40Ω	4.000Ω~39.999Ω	1.0%+5 digits	0.6°	Series
4Ω	0.4000Ω~3.9999Ω	3.0%+10 digits	1.7°	Series
0.4Ω	0.0000Ω~0.3999Ω	7%+20 digits	------	Series

Chapter 6 Maintenance

Warning:

- **Do not repair the instrument arbitrarily; it should be maintained and repaired by professional personnel.**
- **Keep the instrument away from liquid; do not leave articles especially conductive objects in the instrument.**

6.1 Service

If the equipment fails and cannot be switched on, you should first check the battery and external power supply, power jack, etc.; check whether the key is invalid;
If the test result is abnormal, first check if the test accessories have problems, and if there is damage of the spring in the test notch; at the same time review the specification to confirm if the operation is correct;
Do not arbitrarily replace the components and specific parts, please contact the relevant dealer or service company for problems which cannot be confirmed.

6.2 Clean

Before cleaning, user should remove the battery and external power supply and shut down the instrument.
Prevent water or other liquids to enter the instrument through the test slot, keys, or other joints. If it happens by accident, you should immediately stop using it and remove the power supply and battery.
Please clean with a soft cloth and diluted neutral detergent, and carefully wipe the dirty parts to prevent scratches on the surface.
After cleaning, the instrument should be completely dry before used.

Accessories

Standard accessories list:

- Handheld LCR (lithium battery installed)
- CD
- A type C-USB communication cable
- An AC power adapter
- A pair of red / black rubber plugs –alligator clip test line
- A short-circuit bar

Please check according to the accessories list after the box is opened, if any component is missing, please immediately contact the company or the related dealer.